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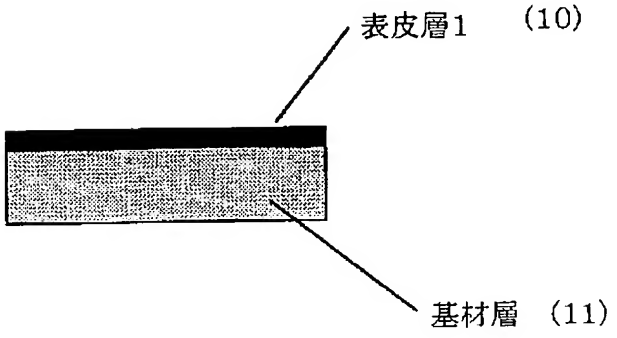
(54)【発明の名称】　防音材

(57)【要約】
【課題】　表皮の審美的機能を有するとともに優れた吸遮音特性を有する防音材を提供するにある。
【解決手段】　防音材は、不織布から構成される多層繊維体であって、その表面に意匠模様が形成されている。好ましくは、熱可塑性繊維体を成形加工した不織布基材と、該基材上に設けた熱融着繊維を主体とする不織布表面層１とを含み、該表面層１上に意匠模様を顕出してなる。



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【特許請求の範囲】

【請求項１】　熱可塑性繊維体を成形加工した不織布基材と、該基材上に設けた熱融着繊維を主体とする不織布表面層１とを含み、該表面層１上に意匠模様を顕出してなることを特徴とする防音材。

【請求項２】　請求項１記載の防音材において、更に、表面層１と基材との間に、不織布繊維体から成る緻密層、又は通気性を有さない熱可塑性のフィルム状樹脂から構成される中間層を設けてなることを特徴とする防音材。

【請求項３】　請求項２記載の防音材において、更に、騒音源と面する側の基材面に、さらに不織布繊維体から成る緻密層、又は通気性を有さない熱可塑性のフィルム状樹脂から構成される表面層２を設けて成ることを特徴とする防音材。

【請求項４】　請求項１～３いずれかの項記載の防音材において、不織布を構成する繊維は熱可塑性ポリエステル繊維であり、捲宿性繊維を含み、かつマトリックス繊維と熱融着性繊維とから構成されることを特徴とする防音材。

【請求項５】　請求項１～４いずれかの項記載の防音材において、意匠模様が熱転写プリント、スクリーンプリントによる捺染法により形成されたものであることを特徴とする防音材。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は防音材に関し、特に騒音を発生する内燃機関等の騒音源に設置する防音カバーとして有用な防音材に関する。

【０００２】

【従来の技術】内燃機関を使用した車両は、車外及び車室内の騒音低減を防止するため、内燃機関に防音カバーを設置する場合が多い。

【０００３】図１に示すように、例えば自動車の場合には、エンジンルーム（２）内のエンジン（１）から発生する騒音をエンジンルームから外に出さないようにするために、例えば防音カバー（３）や、ガラス繊維等の吸音材から構成されるフードインシュレータ（４）がエンジンルーム内に設置されている。また、車室内（６）の騒音低減を目的とするため、車室内（６）とエンジンルーム（２）との隔壁の上部に、例えば吸音材とゴム表面とから構成されるダッシュインシュレータ（５）が設置されている。

【０００４】従来の防音カバーは、一般に、図２に示すように、ナイロン樹脂のような耐熱性に優れる材料で基材（８）が構成され、かつその表面上には意匠模様（７）が付加されている。また、更にその防音性能を向上させるために、防音カバーの下面には、フェルトやウレタン等から成る吸音材（９）を設置して、内燃機関の騒音を吸収する機能を持たせる構造のものや、撥油性を有する表面で吸音材を覆う構造のものがある。

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【０００５】しかしながら、従来の吸音材では、その構成上、厚みや設置面積が騒音を防止する点で十分ではなく、従って、騒音の低減効果も、ある一定レベル以下には低減されず、不十分であった。また、防音カバーそのものの剛性が高いため、防音カバーが振動することで、防音カバー自体が騒音の発生源ともなっていた。

【０００６】

【発明が解決しようとする課題】本発明の目的は、上記従来の問題を解決し、表面の審美的機能を有するとともに優れた吸遮音特性を有する防音材を提供するにある。

【０００７】

【課題を解決するための手段】本発明者らは、防音カバー等に用いる防音材たる基材を不織化し、その表面に、例えばプリント等により意匠模様を付加することによって、防音カバーの意匠性と優れた吸遮音特性が両立できるとを見出し、本発明に到達した。

【０００８】即ち、請求項１記載の防音材は、熱可塑性繊維体を成形加工した不織布基材の上部に、該基材上に設けた熱融着繊維を主体とする不織布表面層１を設置し、該表面層１上に意匠模様を顕出してなることを特徴とする。

【０００９】請求項２記載の防音カバー材は、請求項１記載の防音材において、更に、表面層１と基材との間に、繊維体から成る緻密層、又は通気性を有さない熱可塑性のフィルム状樹脂から構成される中間層を設けてなることを特徴とする。

【００１０】請求項３記載の防音カバー材は、請求項２記載の防音材において、更に、騒音源と面する側の基材面に、さらに繊維体から成る緻密層、又は通気性を有さない熱可塑性のフィルム状樹脂から構成される表面層２を設けて成ることを特徴とする。

【００１１】請求項４記載の防音材は、請求項１～３いずれかの項記載の防音材において、繊維が、熱可塑性ポリエステル繊維であり、捲宿性繊維を含み、かつマトリックス繊維と熱融着性繊維とから構成されることを特徴とする。

【００１２】請求項５記載の防音材は、請求項１～４いずれかの項記載の防音材において、意匠模様が熱転写プリント、スクリーンプリントによる捺染法により形成されたものであることを特徴とする。

【００１３】

【発明の実施の形態】本発明の防音材は、不織布から構成される多層繊維体であって、その表面に意匠模様が形成されている。好ましくは、熱可塑性繊維体を成形加工した不織布基材と、該基材上に設けた熱融着繊維を主体とする不織布表面層１とを含み、該表面層１上に意匠模様を顕出してなるものである。

【００１４】本発明の防音材は、例えば防音カバー等の本体となる基材層（１１）部分を熱可塑性繊維の不織布

体から形成する。

【００１５】不織布を構成する繊維としては、防音材、例えば防音カバーの変形を抑えるために、繊維径を吸音性能から考慮すると、なるべく細径化することが望ましいが、剛性の面から繊維径が０．０５～５０デニールのものが好ましく、更に好ましくは、０．１～３０デニールの熱可塑性繊維、好ましくはポリエステル繊維が適用される。上記繊維径が小さ過ぎるとカード機の通過性が劣り、品質の良い不織布が得られない。一方、繊維径が大き過ぎると表面の肌理が粗くなるので好ましくない。

【００１６】上記ポリエステル繊維のうち、特に入手容易なポリエチレンテレフタレート繊維は融点や引張強度、モジュラスが比較的高くマトリックス繊維としての支持機能を有効に果たすので好ましい。更に好ましくは、ホモポリエステルと共重合ポリエステルとを繊維軸に沿って複合したサイド・バイ・サイド型コンジュゲート繊維は熱処理により捲縮を発現し、不織布の交絡度を高め成形性が増すので好ましい。

【００１７】更に、本発明における不織布を構成する繊維は、少なくとも２種類の短繊維からなり、支持機能を果たすマトリックス繊維と繊維相互間を熱融着性繊維とを含んでなることが好ましい。かかる熱融着繊維としては、通常共重合ポリマー、例えば、イソフタル酸等の共単量体によって融点を低下させた共重合ポリエステル等が好適に使用される。熱融着繊維は熱処理、例えばホモポリエステルの軟化点以下の温度で軟化或いは溶融して融着性を発現する。熱処理は、マトリックス繊維の軟化点温度未満、熱融着繊維の融着性発現温度で行われるが、単独の工程としても或いは上記の平滑化熱処理、熱転写時の熱処理等を利用してもよい。かかる熱処理により、熱融着繊維と交わる構成繊維は交点において接着し、不織布に形態安定性を付与する他、マトリックス繊維の支持機能と協働して、不織布面の凹凸形状を吸収したり、意図的に凹凸を表面に安定に付与することも可能となる。勿論両面に同時に凹凸形状を付与することも可能である。

【００１８】熱融着繊維は、上記の熱融着性ポリマーよりなる単一成分繊維でもよいが、ホモポリマーを芯成分とし、熱融着性共重合ポリマーを鞘成分とするシース・コア型コンジュゲート繊維を用いれば、芯成分の支持機能を維持したまま熱融着機能を果たすことができるので更に好適である。また、サイド・バイ・サイド型コンジュゲート繊維とすれば、過度の融着点の形成による不織布の硬化を防ぐこともできる。

【００１９】繊維の横断面形状としてはレギュラーの円形、或いは偏平、Ｙ形、中空形等の異形断面等、特に制限はない。特に、中空糸を適量ブレンドすることにより、不織布の吸遮音特性を調節することができる。更に、中空糸をサイド・バイ・サイドのコンジュゲート繊維とすることにより、捲縮発現による交絡性、成形性の向上に寄与することもできる。

【００２０】繊維の色調に関しても特に制限はなく、一般的な白色の他、各種色調の原着繊維を単独または組み合わせて使用することも可能である。特に、原着繊維を用いることにより、表面の意匠模様色彩と組み合わせ、装飾、美観の幅を広げることができる。

【００２１】熱融着性繊維の熱融着部の融点は、エンジンルーム内の温度がかなり高くなることが予想されるため、１５０℃以上の融点を有する熱融着成分が望ましい。

【００２２】基材層を構成するマトリックス繊維と熱融着繊維との混合割合は、９０：１０～４０：６０である。かかる範囲であると、適度な剛性と、成形性を有する基材層を得ることができる。

【００２３】基材層の目付けは、例えば５００ｇ／㎡以上、２kg／㎡以下であることが望ましい。５００ｇ／㎡未満では熱融着繊維の含有量を高くしても、所望の剛性と吸音性能を確保することが難しい。また２kg／㎡を超えると性能上問題はないが、重量増を招く。厚みは５㎜以上で最大５０㎜以下が望ましい。５㎜未満では曲げ剛性と吸音性能の低下が大きい。又、５０㎜を超えると狭いエンジンルームへの設置を考えると現実的ではない。

【００２４】さらに基材層（１１）の上部には、熱融着繊維を望ましくは５０重量％以上混合した不織布体の表面層１（１０）を設置する。熱融着性繊維を５０重量％以上と、多量に配合することにより、主繊維との結合点が増え、加熱成形した際に、表面部分の毛羽立ちや、凹凸を少なくすることが可能である。熱融着繊維としては、上記基材層で用いたものを使用することができる。繊維径、断面形状についても同様である。

【００２５】好ましくは、表面層１の主繊維を含めた平均繊維径は２デニール以下が望ましい。平均繊維径が大きくなると表面に凹凸が生じ、意匠性が低下し、また、通気性が高くなることで、音漏れが大きくなることが懸念される。

【００２６】表皮層の目付けとしては、１００ｇ／㎡以上１０００ｇ／㎡以下が望ましい。１００ｇ／㎡未満では表皮層が透けてしまい、基材層が見える部分が現われてくるため、見栄えが悪くなる。１０００ｇ／㎡を超えても大きな問題はないが、エンジンカバーとしての重量が増大するため、１０００ｇ／㎡以下が望ましい。厚みは２～５㎜が望ましい。５㎜を超えると全体的に空隙が増えて見栄えが低下する。

【００２７】更に好ましくは、本発明の防音材は、表面層１と基材層の間に中間層（１２）を設けることで、表面層１のマスをさらに大きくして騒音低減効果を高めることができる。かかる中間層としては、不織布繊維体から成る緻密層、又は通気性を有さない熱可塑性のフィルム状樹脂から構成されるものを使用することができる。不織布繊維体としては、ポリエステル繊維とポリエステ

ル系の熱融着繊維を混合した成形可能な不織布体を用いることができ、緻密層とは上記不織布体を形成時に加熱、圧縮することにより、緻密な層としたものである。また、通気性を有さない熱可塑性のフィルム状樹脂としては、ポリエステル系のフィルム、ポリエチレン系のフィルム状樹脂等を用いることができる。

【００２８】狙いとする騒音の周波数領域において、膜共振を生じさせるような中間層の目付けが望ましく、厚みについては目付けにより一義的に決まる。エンジンカバーを想定した場合、車両の重量増を招くことは好ましくないため、中間層の重量としては数kg／台が限度である。

【００２９】更に好ましくは、本発明の防音材は、上記中間層（１２）に加えて、騒音源と面する側の基材面に、表面層（２）を設けることで、基材の吸音材を中間部分とする２重壁遮音構造体とし、更に騒音低減効果を向上させることができる。かかる表面層２としては、上記中間層と同じものを使用することができる。

【００３０】上記基材層、表面層１、好ましくは中間層及び／又は表面層２を積層する方法としては、基材層、表面層を熱風加熱炉を介して２００℃程度に加熱し、冷間プレスにて成形を行なう。さらに中間層を設置する場合は、冷間プレス機にて基材層が設置された後に、中間層を設置し、さらに表皮層を設置して同時成形を行なう。各層の厚みは表皮層を２～５㎜、基材層を５～５０㎜に成形する。

【００３１】熱転写プリントにより意匠模様を施す不織布は、あらかじめ熱処理またはニードルパンチング等によって予備成形して表面を平滑化しておくことにより、更に均一に意匠模様を転写することが可能となる。

【００３２】不織布表面に意匠性を持たせる製造方法としては、ローラープリント、インクジェット、スクリーンプリント等の湿式プリント方式や転写式の乾式プリント方式の捺染法がある。製造設備の簡素化の観点からみれば、乾式プリントの方が有利である。特に、熱転写プリントシートの模様面を不織布と重ね合わせ、両者を熱盤により加熱及び加圧した後、不織布から熱転写プリントシートを剥離する熱転写プリント法が好ましい。

【００３３】このようにして得られた防音材を、所望する形状にトリミングすることにより、防音カバーとして使用することができる。

【００３４】防音カバー自体に形状付与や、表面部分に意匠性を持たせるための凹凸部分を設けるためには、加熱、プレス工程により、必要な形状とすることができる。ここで、該表面層１の通気性を低く設定することで、表面層の目付けにより、一種の膜共振による吸音性を持たせることも可能である。これは、表面層の質量に応じた共振が発生することで、ある一定周波数で膜共振による高い吸音性能を発揮する現象である。エンジン騒音として特異な周波数領域が存在する場合には、表面層の膜共振を利用することが可能になる。

【００３５】

【実施例】本発明を次の実施例及び比較例により説明する。

＜実施例１＞表面層１としては、２デニールのポリエステル製主繊維５０重量％と２デニールの長円形断面のシース・コア型熱融着繊維（ポリエステル系の芯鞘型熱融着繊維）５０重量％との混合体から、カードクロスレイヤー法により製造した２００ｇ／㎡目付けの不織布を用いた。

【００３６】基材層としては、６デニールのポリエステル製コンジュケート主繊維４０重量％と２デニールの長円形断面のシース・コア型熱融着繊維（ポリエステル系の芯鞘型熱融着繊維）６０重量％の混合体から、カードクロスレイヤー法により製造した８００ｇ／㎡目付けの不織布を用いた。

【００３７】上記表面層１と基材層とを積層し、１８０℃で熱処理して、目付け１０００ｇ／㎡、厚み３０㎜の予備成形体を得た。次いで得られた予備成形体と熱転写プリントシートの転写面を対向して重ね合せ、プレス機で約６０秒間、２００℃で成形して厚み１０㎜に圧縮して、防音材を得た。プレスから取り出した不織布体は所望の意匠模様を得ていることを確認した。さらに、防音カバーとしての形状にトリミングして、防音カバーを得た。得られた防音カバーは、後述する騒音低減試験において従来の防音カバーに比較して吸遮音性能に優れ、意匠性も同等レベルであることが判明した。さらに後述する熱サイクリック試験評価でも形状保持性に優れていた。

【００３８】＜実施例２＞本実施例においては、表面層１の熱融着繊維の配合比を高くして、表面の平滑性を向上させ、意匠性を向上させた。表面層１として、２デニールのポリエステル製主繊維２５重量％と２デニールの長円形断面のシース・コア型熱融着繊維（ポリエステル系の芯鞘型熱融着繊維）７５重量％の混合体から、カードクロスレイヤー法により不織布を製造した以外は、実施例１と同様にして防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも表面の平滑性が向上しており、意匠性が向上していることを確認した。また、騒音低減効果や耐熱性にも優れていた。

【００３９】＜実施例３＞本実施例においては、表面層１の主繊維径を細径化することにより、表面の平滑性を上げ意匠性を向上させた。表面層１として、０．５デニールのポリエステル製主繊維５０重量％と２デニールの長円形断面のシース・コア型熱融着繊維（ポリエステル系芯鞘型熱融着繊維）５０重量％の混合体から、カードクロスレイヤー法により不織布を製造した以外は、実施例１と同様にして、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも表面の平滑性が向上しており、意匠性が向上していることを確認し

た。また、騒音低減効果や耐熱性にも優れていた。

【００４０】＜実施例４＞本実施例においては、基材層の主繊維を異形断面化することにより、繊維体の表面積を増大させ吸音性能を向上させた。基材層として、２デニールのポリエステル製Ｙ型異形断面繊維６０重量％と２デニールの長円形断面のシース・コア型熱融着繊維（ポリエステル系芯鞘型熱融着繊維）４０重量％の混合体から、カードクロスレイヤー法により不織布を製造した以外は、実施例１と同様にして防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも更に騒音低減効果が向上しており、意匠性や耐熱性にも優れていた。

【００４１】＜実施例５＞本実施例においては、実施例４の基材層の目付けを上げることにより、吸音性能を向上させた。基材層として、２デニールのポリエステル製Ｙ型異形断面繊維６０重量％と２デニールの長円形断面のシース・コア型熱融着繊維（ポリエステル系芯鞘型熱融着繊維）４０重量％の混合体から、カードクロスレイヤー法により１２００ｇ／㎡の不織布を製造した以外は、実施例１と同様にして防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも騒音低減効果が更に向上しており、意匠性や耐熱性にも優れていた。

【００４２】＜実施例６＞本実施例においては、実施例１の基材層と表面層１との中間に不織布繊維体の緻密層を設置することで、遮音壁構造の壁に相当する部分を構成し、遮音性能を向上させた。表面層１及び基材層は実施例１と同様とし、中間層として、表面層１と同様の繊維配合で目付けを２倍の４００ｇ／㎡の不織布を製造した以外は、実施例１と同様にして防音材及び防音カバーを得た。プレスから取り出した防音材は、実施例１よりも騒音低減効果が更に向上しており、意匠性や耐熱性にも優れていた。

【００４３】＜実施例７＞本実施例においては、実施例１の基材層と表面層１との中間に熱可塑性のフィルム状中間層を設置することで、遮音壁構造の壁に相当する部分を構成し、遮音性能を向上させた。表面層１及び基材層は実施例１と同様とし、中間層として、ポリエチレン（ＰＥ）を表面層１の下面に４００ｇ／㎡塗布してフィルムを調製した。このフィルムが設けられた表面層１と基材層を積層し、実施例１と同様に成形を行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも騒音低減効果が更に向上しており、意匠性や耐熱性にも優れていた。

【００４４】＜実施例８＞本実施例においては、実施例１の基材層と表面層１との中間に熱可塑性のフィルム状中間層を設置することで、遮音壁構造の壁に相当する部分を構成し、遮音性能を向上させた。またさらに中間層の目付けを大きくして、質量の効果（遮音性能向上）を確保した。表面層１及び基材層は実施例１と同様とした。中間層として、エチレンビニルアセテート（ＥＶＡ）を表面層１の下面に１５００ｇ／㎡塗布して、フィルムを調製した。このフィルムが設けられた表面層１と基材層を積層し、実施例１と同様に成形を行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも騒音低減効果が更に向上しており、意匠性や耐熱性にも優れていた。

【００４５】＜実施例９＞本実施例においては、実施例６に加えて基材層の下部に表面層２を設置することで、中間層と表面層２において２重壁遮音構造を形成し、遮音性能を更に向上させた。表面層１、中間層及び基材層は実施例６と同様とし、表面層２は、実施例６の中間層と同様のものを設置した以外は、実施例１と同様に成形を行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも騒音低減効果が更に向上しており、意匠性や耐熱性にも優れていた。

【００４６】＜実施例１０＞本実施例においては、実施例９において、中間層と表面層２を熱可塑性のフィルムに代替したものである。フィルムを用いることにより、完全に通気を遮断することが可能になるため、特に高周波域での遮音性能を向上させることができた。また、中間層と表面層２において２重壁遮音構造を形成しており、遮音性能を更に向上させた。表面層１及び基材層は、実施例９と同様とした。中間層として、ポリエチレン（ＰＥ）を表面層１の下面に４００ｇ／㎡塗布してフィルムを調製し、表面層２として基材層の下面にポリエチレン（ＰＥ）を４００ｇ／㎡塗布してフィルムを調製した。実施例１と同様に成形を行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも騒音低減効果が更に向上しており、意匠性や耐熱性にも優れていた。

【００４７】＜実施例１１＞本実施例においては、実施例１０において、中間層と表面層２の目付けを大きくしたものである。また、中間層と表面層２において２重壁遮音構造を形成し、遮音性能を向上させた。表面層１及び基材層は実施例１０と同様とした。中間層として、エチレンビニルアセテート（ＥＶＡ）を表面層１の下面に１５００ｇ／㎡塗布してフィルムを調製し、表面層２として基材層の下面にエチレンビニルアセテート（ＥＶＡ）を１５００ｇ／㎡塗布してフィルムを調製した。実施例１と同様に成形を行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも騒音低減効果が更に向上しており、意匠性や耐熱性にも優れていた。

【００４８】＜実施例１２＞本実施例においては、基材層の主繊維に太デニール繊維を混合することで剛性向上させた。表面層１は、実施例１と同様とした。基材層として、６デニールのコンジュケート繊維１０重量％と１３デニールのコンジュケート繊維５０重量％と、２デニールの長円形断面のシース・コア型熱融着繊維４０重量

％との混合体から、カードクロスレイヤー法により不織布を製造した。目付けは８００ｇ／㎡とした。実施例１と同様に成形を行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも更に剛性が向上しており、意匠性や騒音低減効果にも優れていた。

【００４９】＜比較例１＞表面層１として、２デニールの主繊維５０重量％と２デニールの長円形断面のシース・コア型熱融着繊維５０重量％の混合体から、カードクロスレイヤー法により５０ｇ／㎡目付けの不織布を製造した。基材層として６デニールコンジュケート主繊維４０重量％と２デニールの長円形断面のシース・コア型熱融着繊維６０重量％の混合体から、カードクロスレイヤー法により８００ｇ／㎡目付けの不織布を製造した。表面層１と基材層を積層し、１８０℃で熱処理して目付け１０００ｇ／㎡、厚み３０㎜の予備成形体を得た。次いで予備成形体と熱転写プリントシートの転写面を対向して重ね合せ、プレス機で約６０秒間、２００℃で成形した。プレスから取り出した不織布は表面層の目付けが不足しているために、基材層の一部が露出しており、所望の意匠模様を得ることができなかった。さらに、防音カバーとしての形状にトリミングして、防音カバーを得た。騒音低減効果は実施例１よりも劣っていた。

【００５０】＜比較例２＞表面層１として、２デニールの主繊維９０重量％と２デニールの長円形断面のシース・コア型熱融着繊維１０重量％の混合体から、カードクロスレイヤー法により不織布を製造した以外は、実施例１と同様に行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも表面の平滑性が低下しており、意匠性が不足していた。これは、表面層の熱融着繊維量が不足しているために、主繊維が毛羽立つたためと考えられる。

【００５１】＜比較例３＞表面層１として、１５０デニールの主繊維５０重量％と２デニールの長円形断面のシース・コア型熱融着繊維５０重量％の混合体とし、カードクロスレイヤー法により不織布を製造した以外は、実施例１と同様に行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも表面の平滑性が平滑性が低下しており、意匠性が不足していた。

【００５２】＜比較例４＞基材層として、１５０デニール繊維６０重量％と２デニールの長円形断面のシース・コア型熱融着繊維４０重量％の混合体とし、カードクロスレイヤー法により不織布を製造した以外は、実施例１と同様に行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも騒音低減効果が低下していた。

【００５３】＜比較例５＞基材層として、６デニールコンジュケート繊維９０重量％と２デニールの長円形断面のシース・コア型熱融着繊維１０重量％の混合体から、カードクロスレイヤー法により不織布を製造した以外は、実施例１と同様に行って、防音材及び防音カバーを得た。プレスから取り出した防音材は実施例１よりも耐熱性が低下していた。

【００５４】上記実施例１～１２及び比較例１～５で得られた防音材の構成を表１に示す。

【試験例】上記実施例１～１２及び比較例１～５で得られた防音材及び防音カバーについて以下の試験を行った。

＜騒音低減試験＞実機（エンジンに防音カバーを設置し、シャシーダイナモ上で走行状態を再現し、ボンネット上部に設置したマイク）にて騒音レベルの変化を測定した。その結果を表１に示す。表中の評価は、以下の基準にて行った。

◎　…非常に優れる
○　…優れている
Δ　…同等レベル
×　…悪化している

【００５５】＜耐熱性試験＞熱サイクリック試験により、耐熱性を評価した。その結果を表１に示す。防音カバーとて試作した板状の基材から、一定のサイズに切出し、数点支持して９０～１２０℃と室温の間をサイクリックに加熱冷却をくり返し、基材の変形量（意匠性）を測定した。

【００５６】＜剛性試験＞短冊状に切り出した試料を、３点曲げ試験法で曲げ剛性等を評価した。

【００５７】

【表１】

各仕様の考え方		表皮層1 熱融着繊維 重量%	表皮層1 主繊維 重量%	表皮層1 目付け g／㎡	基材層 熱融着繊維 重量%	基材層 主繊維1 重量%	基材層 主繊維2 重量%	基材層 目付け g／㎡	中間層 熱融着繊維 重量%	中間層 主繊維 重量%	中間層 目付け g／㎡	表皮層2 熱融着繊維 重量%	表皮層2 主繊維 重量%	表皮層2 目付け g／㎡	吸遮音性能	意匠性	剛性
基本仕様	実施例1	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	○	○
表皮層のバインダアップで平滑性を上げ、意匠性向上	実施例2	2d:75%	2d:25%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	◎	○
主繊維細径化による表皮層の平滑性アップ、意匠性向上	実施例3	2d:50%	0.5d:50%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	◎	○
基材層の主繊維異形断面化による吸音性能向上	実施例4	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	○	○
実施例4の基材層目付けアップによる吸音性能向上	実施例5	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	1200	−	−	−	−	−	−	◎	○	○
実施例1＋中間層で遮音性能向上	実施例6	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	2d:50%	2d:50%	400	−	−	−	◎	○	○
実施例1＋中間層で遮音性能向上：フィルム	実施例7	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	熱可塑性フィルム(PE)		400	−	−	−	○	○	○
実施例1＋中間層の目付けアップで遮音性能向上	実施例8	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	熱可塑性フィルム(EVA)		1500	−	−	−	◎	○	○
実施例1＋中間層＋表皮層2で遮音性能向上	実施例9	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	2d:50%	2d:50%	400	2d:50%	2d:50%	400	◎	○	○
実施例1＋中間層＋表皮層2フィルムで遮音性能向上	実施例10	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	熱可塑性フィルム(PE)		400	熱可塑性フィルム(PE)		400	◎	○	○
実施例1＋中間層＋表皮層2フィルムで遮音性能向上	実施例11	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	熱可塑性フィルム(EVA)		1500	熱可塑性フィルム(EVA)		1500	◎	○	○
基材層の剛性向上	実施例12	2d:50%	2d:50%	200	2d:40%	6dC:10%	13dC:50%	800	−	−	−	−	−	−	○	○	◎
表皮層の目付け不足で意匠性NG	比較例1	2d:50%	2d:50%	50	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	×	○
表皮層の熱融着繊維不足で表皮に毛羽立ちNG	比較例2	2d:10%	2d:90%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	×	○
表皮層の太繊維化で凹凸NG，吸音性能低下	比較例3	2d:50%	150d:50%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	△	×	○
基材層の太繊維化で吸音性能低下	比較例4	2d:50%	2d:50%	200	2d:40%	150d:60%	−	800	−	−	−	−	−	−	×	×	○
基材層の熱融着繊維不足で剛性低下	比較例5	2d:50%	2d:50%	200	2d:10%	6dC:90%	−	800	−	−	−	−	−	−	×	△	×

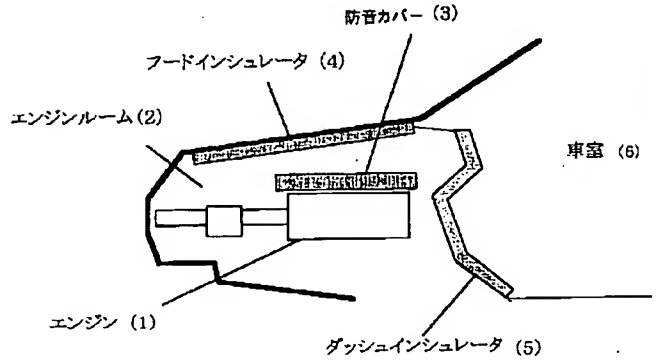
【００５８】

【発明の効果】本発明によれば、防音カバーの基材を従来の樹脂（例えばナイロン樹脂）から剛性と吸音性を両立させた不織布防音材に代替し、更に好ましくは緻密な中間層及び／又は樹脂フィルムを設けることによって、吸音材に遮音壁構造を有する、優れた遮音構造の防音材を得ることができる。またその、表面には所望の意匠模様を印刷したことから、遮音性能と意匠性を両立させることも可能になった。

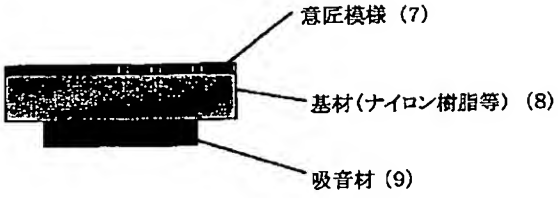
【図面の簡単な説明】

【図１】　自動車のエンジンルーム内を模式的に示した図である。
【図２】　従来の防音カバーの概略断面図である。
【図３】　本発明による、防音カバーの一例の概略断面図である。
【図４】　本発明による、中間層を設けた防音カバーの概略断面図である。
【図５】　本発明による、表面層２を設けた防音カバーの概略断面図である。
【符号の説明】
1　エンジン
2　エンジンルーム
＊3　防音カバー
4　フードインシュレータ
5　ダッシュインシュレータ
6　車室
7　意匠模様
8　基材（ナイロン樹脂等）
9　吸音材
10　表面層１
11　基材層
12　中間層
13　表面層２

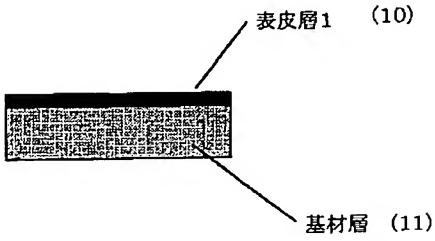
【図１】



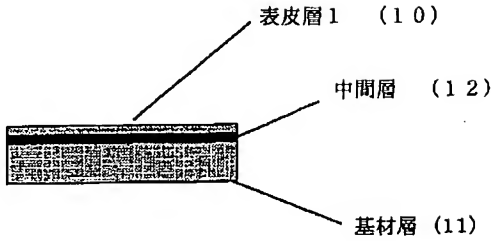
【図２】



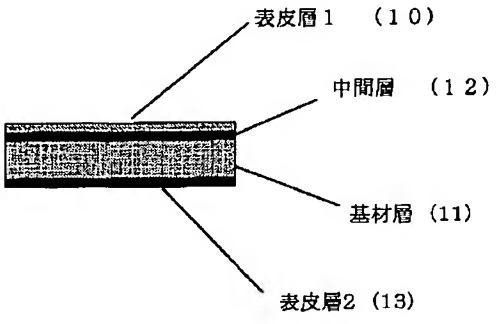
【図３】



【図４】



【図５】



フロントページの続き

Ｆターム(参考) 4F100 AK01A AK01C AK41A AK41B
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BA10A BA10B BA10C BA15
BA16 DG15A DG15B DG15C
DG15K GB32 HB00 HB00B
JB16A JB16C JD02C JH01
JJ03
4L047 AA21 AA27 AA28 BA09 BB09
CA05 CA06 CA19 CB03 CC09
5D061 AA07 AA22 AA23 BB17 BB21
DD07

[Claim(s)]

[Claim 1] The sound insulating material characterized by coming to carry out the phanerosis of the design pattern on this surface layer 1 including the nonwoven fabric surface layer 1 which makes a subject the thermal melting arrival fiber which established the thermoplastic fiber object on the nonwoven fabric base material which carried out fabrication, and this base material.

[Claim 2] The sound insulating material characterized by coming further to prepare the compact layer which consists of a nonwoven fabric fiber object between a surface layer 1 and a base material, or the interlayer who consists of thermoplastic film-like resin which does not have permeability in a sound insulating material according to claim 1.

[Claim 3] The sound insulating material characterized by forming the compact layer which changes from a nonwoven fabric fiber object to a noise source and the facing near base material side further in a sound insulating material according to claim 2, or the surface layer 2 which consists of thermoplastic film-like resin which does not have permeability, and changing.

[Claim 4] claims 1-3 -- the sound insulating material which the fiber which constitutes a nonwoven fabric is thermoplastic polyester fiber, and is characterized by consisting of a matrix fiber and thermal melting arrival nature fiber in a sound insulating material given [one of] in a term, including ****** fiber.

[Claim 5] claims 1-4 -- the sound insulating material characterized by forming a design pattern of the textile printing by the hot printing print and screen printing in a sound insulating material given [one of] in a term.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to a sound insulating material useful as a sound hood installed in the noise source of the internal combustion engine which generates the noise about a sound insulating material.

[0002]

[Description of the Prior Art] In order that the car which used the internal combustion engine may prevent the noise reduction of the outside of vehicle, and vehicle interior of a room, a sound hood is installed in an internal combustion engine in many cases.

[0003] The hood insulator (4) which consists of a sound hood (3) and acoustic material, such as a glass fiber, in order to make it not take out outside the noise which is generated from the engine (1) in an engine room (2) in the case of an automobile from an engine room as shown in drawing 1 is installed in the engine room. Moreover, in order to aim at the noise reduction of vehicle indoor (6), the dash insulator (5) which consists of acoustic material and a rubber front face is installed in the upper part of the septum of vehicle indoor (6) and an engine room (2).

[0004] As the conventional sound hood is generally shown in drawing 2 , a base material (8) consists of ingredients which are excellent in thermal resistance like

Nylon, and the design pattern (7) is added on the front face. Furthermore, in order to raise the sound isolation engine performance, the acoustic material (9) which consists of the felt, urethane, etc. is installed in the inferior surface of tongue of a sound hood, and there is a thing of wrap structure in it about acoustic material on the thing of the structure of giving the function which absorbs an internal combustion engine's noise, and the front face which has oil repellency.

[0005] However, on the configuration, it was not enough in that the noise is prevented, therefore the reduction effectiveness of the noise was not reduced, either but the conventional acoustic material of thickness or installation area was inadequate [the effectiveness] for below a certain fixed level. Moreover, since the rigidity of the sound hood itself was high, the sound hood itself had also become the generation source of the noise because a sound hood vibrates.

[0006]

[Problem(s) to be Solved by the Invention] The purpose of this invention solves the above-mentioned conventional problem, and is to offer the sound insulating material which has the sound absorbing and insulating characteristics which were excellent while having the surface aesthetic function.

[0007]

[Means for Solving the Problem] this invention persons ******(ed) the sound insulating material slack base material used for a sound hood etc., and reached a header and this invention by adding a design pattern to the front face with a print etc. in ** with which the design nature of a sound hood and outstanding sound absorbing and insulating characteristics are compatible.

[0008] That is, a sound insulating material according to claim 1 installs the nonwoven fabric surface layer 1 which makes a subject the thermal melting arrival fiber prepared on this base material in the upper part of the nonwoven fabric base material which carried out fabrication of the thermoplastic fiber object, and is characterized by coming to carry out the phanerosis of the design pattern on this surface layer 1.

[0009] Sound hood material according to claim 2 is characterized by coming further to prepare the compact layer which consists of a fiber object between a surface layer 1 and a base material, or the interlayer who consists of thermoplastic film-like resin which does not have permeability in a sound insulating material according to claim 1.

[0010] Sound hood material according to claim 3 is characterized by forming the compact layer which changes from a fiber object to a noise source and the facing near base material side further, or the surface layer 2 which consists of thermoplastic film-like resin which does not have permeability, and changing in a sound insulating material according to claim 2.

[0011] a sound insulating material according to claim 4 -- claims 1-3 -- in a sound insulating material given [one of] in a term, fiber is thermoplastic polyester fiber and is characterized by consisting of a matrix fiber and thermal melting arrival nature fiber, including ****** fiber.

[0012] a sound insulating material according to claim 5 -- claims 1-4 -- in a sound insulating material given [one of] in a term, a design pattern is characterized by being formed of the textile printing by the hot printing print and screen printing.

[0013]

[Embodiment of the Invention] The sound insulating material of this invention is a multilayer fiber object which consists of nonwoven fabrics, and the design pattern is formed in the front face. It comes to carry out the phanerosis of the design pattern on this surface layer 1 including the nonwoven fabric surface layer 1 which makes a subject the thermal melting arrival fiber which established the thermoplastic fiber object preferably on the nonwoven fabric base material which carried out fabrication, and this base material.

[0014] The sound insulating material of this invention forms for example, the base material layer (11) part used as the body of a sound hood etc. from the nonwoven fabric object of thermoplastic fiber.

[0015] that a rigid field to whose diameter of fiber is 0.05-50 deniers although narrow-diameter-izing if possible is desirable as fiber which constitutes a nonwoven fabric when the diameter of fiber is taken into consideration from the absorption-of-sound engine performance in order to suppress deformation of a sound insulating material, for example, a sound hood, -- desirable -- further -- desirable -- 0.1-30-denier thermoplastic fiber -- polyester fiber is applied preferably. If the above-mentioned diameter of fiber is too small, the permeability of a carding machine will be inferior and a quality nonwoven fabric will not be obtained. On the other hand, since surface texture will become coarse if the diameter of fiber is too large, it is not desirable.

[0016] the inside of the above-mentioned polyester fiber -- especially -- acquisition -- since the melting point, tensile strength, and a modulus achieve the support function as a matrix fiber effectively comparatively highly, an easy polyethylene terephthalate fiber is desirable. Furthermore, preferably, since the side-by-side mold conjugate fiber which compounded gay polyester and copolymerized polyester along with the fiber axis discovers crimp by heat treatment, and raises whenever [confounding / of a nonwoven fabric] and its moldability increases, it is desirable.

[0017] Furthermore, as for the fiber which constitutes the nonwoven fabric in this invention, it is desirable to come to include [thermal melting arrival nature fiber] the matrix fiber which consists of at least two kinds of staple fibers, and achieves a support function, and between fiber. As this thermal melting arrival fiber, the copolymerized polyester to which the melting point was usually reduced by comonomers, such as a copolymerization polymer, for example, isophthalic acid etc., is used suitably. Thermal melting arrival fiber is softened or fused at the temperature below the softening temperature of heat treatment, for example, gay polyester, and discovers welding nature. Although heat treatment is performed at the welding nature manifestation temperature of thermal melting arrival fiber under the softening temperature temperature of a matrix fiber, the above-mentioned smoothing heat treatment also as an independent process, heat treatment at the time of hot printing, etc. may be used. By this heat treatment, paste up the configuration fiber which crosses thermal melting arrival fiber on an intersection, and gestalt stability is given to a nonwoven fabric, and also it collaborates with the support function of a matrix fiber, and the shape of toothing of a nonwoven fabric side is absorbed, or it becomes possible to give irregularity intentionally to stability on a front face. It is also possible to give the shape of toothing at coincidence to both sides, of course.

[0018] Although the single component fiber which consists of the above-mentioned thermal melting arrival nature polymer is sufficient, if the sheath core mold conjugate fiber which uses a homopolymer as a heart component and uses a thermal melting arrival nature copolymerization polymer as a sheath component is used, since thermal melting arrival fiber can achieve a thermal melting arrival function, with the support function of a heart component maintained, it is still more suitable. Moreover, hardening of the nonwoven fabric by formation of a side-by-side mold conjugate fiber, then too much welding point can also be prevented.

[0019] Especially a limit does not have variant cross sections, such as circular [regular as a cross-section configuration of fiber] or flatness, a Y-globe type, and a hollow form, etc. The sound absorbing and insulating characteristics of a nonwoven fabric can be adjusted by carrying out the optimum dose blend of the hollow filament especially. Furthermore, it can also contribute to improvement in the entanglement by crimp manifestation, and a moldability by making a hollow filament into a side-by-side conjugate fiber.

[0020] There is especially no limit also about the color tone of fiber, and it is also possible in the arrival fiber at Hara of various color tones besides general white independent or to combine and use it. By using the arrival fiber at Hara especially, it can combine with surface design encaustic color, and the width of face of an ornament and a fine sight can be expanded.

[0021] Since it is expected that the temperature in an engine room becomes quite high, the melting point of the thermal melting arrival section of thermal melting arrival nature fiber has the desirable thermal melting arrival component which has the melting point of 150 degrees C or more.

[0022] The mixed rates of the matrix fiber and thermal melting arrival fiber which constitute a base material layer are 90:10-40:60. The base material layer which has moderate rigidity and a moldability as it is this range can be obtained.

[0023] As for the superintendent officer of a base material layer, it is desirable that it is two or more 500 g/m and 2 or less [2kg //m]. In less than two 500 g/m, even if it makes the content of thermal melting arrival fiber high, it is difficult to secure desired rigidity and the absorption-of-sound engine performance. Moreover, although there is no engine-performance top problem when 2 kg/m2 is exceeded, the increase of weight is caused. A maximum of 50mm or less of thickness is desirable at 5mm or more. In less than 5mm, flexural rigidity and absorption-of-sound performance degradation are large. Moreover, it is not realistic, if it exceeds 50mm and the installation to a narrow engine room will be considered.

[0024] Furthermore, the surface layer 1 of the nonwoven fabric object which mixed thermal melting arrival fiber 50% of the weight or more desirably (10) is installed in the upper part of a base material layer (11). When a joint with the main fiber increased and carries out hot forming of the thermal melting arrival nature fiber by blending with 50 % of the weight or more so much, it is possible the fuzz of a surface part and to lessen irregularity. As thermal melting arrival fiber, what was used in the above-mentioned base material layer can be used. The same is said of the diameter of fiber, and a cross-section configuration.

[0025] Preferably, the diameter of average fiber including the main fiber of a surface

layer 1 has desirable 2 deniers or less. We are anxious about sound leakage becoming large because irregularity will arise on a front face if the diameter of average fiber becomes large, design nature falls and permeability becomes high.

[0026] As a superintendent officer of an epidermis layer, two or less [2 or more / 100g //m / g //m / 1000] are desirable. Less than [100g //m] by two, an epidermis layer is transparent, and since the part whose base material layer can be seen appears, appearance worsens. Even if it exceeds 1000 g/m2, there is no big problem, but since the weight as engine enclosure increases, two or less [1000g //m] are desirable. 2-5mm of thickness is desirable. If it exceeds 5mm, on the whole, openings will increase in number, and appearance will fall.

[0027] Furthermore, preferably, between a surface layer 1 and a base material layer, by preparing an interlayer (12), the sound insulating material of this invention can enlarge the mass of a surface layer 1 further, and can heighten the noise-reduction effectiveness. As this interlayer, the compact layer which consists of a nonwoven fabric fiber object, or the thing which consists of thermoplastic film-like resin which does not have permeability can be used. As a nonwoven fabric fiber object, the nonwoven fabric object which mixed polyester fiber and the thermal melting arrival fiber of a polyester system and which can be fabricated can be used, and a compact layer is taken as a precise layer by heating and compressing the above-mentioned nonwoven fabric object at the time of formation. Moreover, as thermoplastic film-like resin which does not have permeability, the film of a polyester system, the film-like resin of a polyethylene system, etc. can be used.

[0028] In the frequency domain of the noise made into an aim, the superintendent officer of an interlayer who produces film resonance is desirable, and is uniquely decided by the superintendent officer about thickness. When engine enclosure is assumed, since it is not desirable to cause the increase of weight of a car, as an interlayer's weight, a set is a limit in several kg /.

[0029] Furthermore, preferably, in addition to the above-mentioned interlayer (12), by preparing a surface layer (2) in a noise source and the facing near base material side, the sound insulating material of this invention can be used as the double wall sound-insulating-construction object which makes acoustic material of a base material an interstitial segment, and can raise the noise-reduction effectiveness further. As this surface layer 2, the same thing as the above-mentioned interlayer can be used.

[0030] As the above-mentioned base material layer, a surface layer 1, and an approach of carrying out the laminating of an interlayer and/or the surface layer 2 preferably, a base material layer and a surface layer are heated at about 200 degrees C through a hot blast heating furnace, and it fabricates in cold pressing When installing an interlayer furthermore, after a base material layer is installed with a cold pressing machine, an interlayer is installed, an epidermis layer is installed further and coincidence shaping is performed. The thickness of each class fabricates an epidermis layer to 2-5mm, and fabricates a base material layer to 5-50mm.

[0031] The nonwoven fabric which gives a design pattern with a hot printing print becomes possible [imprinting a design pattern to homogeneity] further by preforming by heat treatment or needle punching beforehand, and graduating the front face. .

[0032] As the manufacture approach of giving design nature, the textile printing of wet print methods, such as a roller print, an ink jet, and screen printing, or the dry type print method of an imprint type is shown in a nonwoven fabric front face. If it sees from a viewpoint of the simplification of a manufacturing facility, the dry type print is more advantageous. After heating and pressurizing a non-woven fabric, superposition, and both for the encaustic side of a hot printing print sheet by the heating plate especially, the hot printing printing method which exfoliates a hot printing print sheet from a nonwoven fabric is desirable.

[0033] Thus, it can be used as a sound hood by trimming the obtained sound insulating material in the configuration for which it asks.

[0034] In order to prepare a part for configuration grant and the concave heights for giving design nature to a surface part in the sound hood itself, it can consider as a required configuration according to heating and a press process. It is also possible to give the absorption-of-sound nature by a kind of film resonance by the superintendent officer of a surface layer by setting up the permeability of this surface layer 1 low here. This is that the resonance according to the mass of a surface layer occurs, and is the phenomenon of demonstrating the high absorption-of-sound engine performance by film resonance by a certain constant frequency. When a frequency domain unique as engine noise exists, it becomes possible to use film resonance of a surface layer.

[0035]

[Example] A following example and the following example of a comparison explain this invention. As a <example 1> surface layer 1, the nonwoven fabric of the 200 g/m2 superintendent officer who manufactured by the card cross layer method was used from the 50 % of the weight of the 2-denier main fiber made from polyester, and 50 % of the weight [of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section] (sheath-core mold thermal melting arrival fiber of a polyester system) mixture.

[0036] As a base material layer, the non-woven fabric of the 800 g/m2 superintendent officer who manufactured by the card cross layer method was used from the mixture of 40 % of the weight of 6-denier KONJUKETO main fiber made from polyester, and 60 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (sheath-core mold thermal melting arrival fiber of a polyester system).

[0037] The laminating of the above-mentioned surface layer 1 and the base material layer was carried out, it heat-treated at 180 degrees C, and superintendent officer 1000 g/m2 and a preforming object with a thickness of 30mm were acquired. Subsequently, the acquired imprint side of a preforming object and a hot printing print sheet was fabricated at 200 degrees C for about 60 seconds with superposition and a press machine face to face, it compressed into the thickness of 10mm, and the sound insulating material was obtained. It checked that the nonwoven fabric object picked out from the press had acquired the desired design pattern. Furthermore, it trimmed in the configuration as a sound hood, and the sound hood was obtained. The obtained sound hood was excellent in sound-absorbing-and-insulating ability in the noise-reduction trial mentioned later as compared with the conventional sound hood, and it became clear that design nature was also equivalent level. It excelled in configuration holdout also by heat cyclic test evaluation furthermore mentioned later.

[0038] In <example 2> this example, the compounding ratio of the thermal melting arrival fiber of a surface layer 1 was made high, surface smooth nature was raised, and design nature was raised. As a surface layer 1, the sound insulating material and the sound hood were obtained from the mixture of the 25 % of the weight of the 2-denier main fiber made from polyester, and 75 % of the

weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (sheath-core mold thermal melting arrival fiber of a polyester system) like the example 1 except having manufactured the nonwoven fabric by the card cross layer method. It checked that surface smooth nature of the sound insulating material picked out from the press was improving rather than the example 1, and design nature was improving. Moreover, it excelled also in the noise-reduction effectiveness or thermal resistance.

[0039] In <example 3> this example, by narrow-diameter-izing the diameter of the main fiber of a surface layer 1, surface smooth nature was raised and design nature was raised. As a surface layer 1, the sound insulating material and the sound hood were obtained from the mixture of the 50 % of the weight of the 0.5-denier main fiber made from polyester, and 50 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (polyester system sheath-core mold thermal melting arrival fiber) like the example 1 except having manufactured the non-woven fabric by the card cross layer method. It checked that surface smooth nature of the sound insulating material picked out from the press was improving rather than the example 1, and design nature was improving. Moreover, it excelled also in the noise-reduction effectiveness or thermal resistance.

[0040] In <example 4> this example, by forming the main fiber of a base material layer into a variant cross section, the surface area of a fiber object was increased and the absorption-of-sound engine performance was raised. As a base material layer, the sound insulating material and the sound hood were obtained from the mixture of 60 % of the weight of 2-denier Y mold modified cross section fibers made from polyester, and 40 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (polyester system sheath-core mold thermal melting arrival fiber) like the example 1 except having manufactured the nonwoven fabric by the card cross layer method. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0041] In <example 5> this example, the absorption-of-sound engine performance was raised by raising the superintendent officer of the base material layer of an example 4. As a base material layer, the sound insulating material and the sound hood were obtained from the mixture of 60 % of the weight of 2-denier Y mold modified cross section fibers made from polyester, and 40 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (polyester system sheath-core mold thermal melting arrival fiber) like the example 1 except having manufactured the nonwoven fabric of 1200 g/m2 by the card cross layer method. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0042] In <example 6> this example, it is installing the compact layer of a nonwoven fabric fiber object in the middle of the base material layer of an example 1, and a surface layer 1, the part equivalent to the wall of noise-proof wall structure was constituted, and the noise insulation engine performance was raised. The surface layer 1 and the base material layer presupposed that it is the same as that of an example 1, and obtained the sound insulating material and the sound hood like the example 1 except having manufactured the twice as many nonwoven fabric of 400g/m2 as this for the superintendent officer by the same fiber combination as a surface layer 1 as an interlayer. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0043] In <example 7> this example, it is installing a thermoplastic film-like interlayer in the middle of the base material layer of an example 1, and a surface layer 1, the part equivalent to the wall of noise-proof wall structure was constituted, and the noise insulation engine performance was raised. The surface layer 1 and the base material layer presupposed that it is the same as that of an example 1, applied polyethylene (PE) to the inferior surface of tongue of a surface layer 1 two times 400 g/m as the middle class, and prepared the film. The laminating of the surface layer 1 and base material layer in which this film was prepared was carried out, it fabricated like the example 1, and the sound insulating material and the sound hood were obtained. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0044] In <example 8> this example, it is installing a thermoplastic film-like interlayer in the middle of the base material layer of an example 1, and a surface layer 1, the part equivalent to the wall of noise-proof wall structure was constituted, and the noise insulation engine performance was raised. Furthermore, an interlayer's superintendent officer was enlarged and the effectiveness (improvement in the noise insulation engine performance) of mass was secured. The surface layer 1 and the base material layer presupposed that it is the same as that of an example 1. As the middle class, 1500g (EVA) /of ethylene vinyl acetate was applied to the inferior surface of tongue of a surface layer 1 two times m, and the film was prepared. The laminating of the surface layer 1 and base material layer in which this film was prepared was carried out, it fabricated like the example 1, and the sound insulating material and the sound hood were obtained. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0045] In <example 9> this example, it is installing a surface layer 2 in the lower part of a base material layer in addition to an example 6, double wall sound insulating construction was formed in the interlayer and the surface layer 2, and the noise insulation engine performance was raised further. The surface layer 1, the interlayer, and the base material layer presupposed that it is the same as that of an example 6, except the surface layer 2 having installed the same thing as the interlayer of an example 6, fabricated like the example 1 and obtained the sound insulating material and the sound hood. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0046] In <example 10> this example, a thermoplastic film is substituted for an interlayer and a surface layer 2 in an example 9. Since it became possible to intercept aeration completely by using a film, the noise insulation engine performance in a RF region was able to be raised especially. Moreover, double wall sound insulating construction was formed in the interlayer and the surface layer 2, and the noise insulation engine performance was raised further. The surface layer 1 and the base material layer presupposed that it is the same as that of an example 9. As the middle class, 400g (PE) /of polyethylene was applied to the inferior surface of tongue of a surface layer 1 two times m, the film was prepared, polyethylene (PE) was applied to the inferior surface of tongue of a base material layer two times 400 g/m as a surface layer 2, and the film was prepared. It fabricated like the example 1 and the sound insulating material and the sound hood were obtained. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0047] In <example 11> this example, the superintendent officer of an interlayer and a surface

layer 2 is enlarged in an example 10. Moreover, double wall sound insulating construction was formed in the interlayer and the surface layer 2, and the noise insulation engine performance was raised. The surface layer 1 and the base material layer presupposed that it is the same as that of an example 10. As the middle class, ethylene vinyl acetate (EVA) was applied to the inferior surface of tongue of a surface layer 1 two times 1500 g/m, the film was prepared, 1500g (EVA) /of ethylene vinyl acetate was applied to the inferior surface of tongue of a base material layer two times m as a surface layer 2, and the film was prepared. It fabricated like the example 1 and the sound insulating material and the sound hood were obtained. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0048] In <example 12> this example, rigid improvement was carried out by mixing ** denier fiber for the main fiber of a base material layer. The surface layer 1 presupposed that it is the same as that of an example 1. As a base material layer, the nonwoven fabric was manufactured by the card cross layer method from the 10 % of the weight of 6-denier KONJUKETO fiber, 50 % of the weight of 13-denier KONJUKETO fiber, and 40 % of the weight [of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section] mixture. The superintendent officer was taken as 800 g/m2. It fabricated like the example 1 and the sound insulating material and the sound hood were obtained. Rigidity of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or the noise-reduction effectiveness.

[0049] As a <example 1 of comparison> surface layer 1, 50 g/m2 superintendent officer's nonwoven fabric was manufactured by the card cross layer method from the mixture of the 50 % of the weight of the 2-denier main fiber, and 50 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section. 800 g/m2 superintendent officer's nonwoven fabric was manufactured by the card cross layer method as a base material layer from the mixture of 40 % of the weight of 6-denier KONJUKETO main fiber, and 60 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section. The laminating of a surface layer 1 and the base material layer was carried out, it heat-treated at 180 degrees C, and superintendent officer 1000 g/m2 and a preforming object with a thickness of 30mm were acquired. Subsequently, the imprint side of a preforming object and a hot printing print sheet was fabricated at 200 degrees C for about 60 seconds with superposition and a press machine face to face. Since the nonwoven fabric picked out from the press ran short of the superintendent officers of a surface layer, a part of base material layer was exposed, and it was not able to acquire a desired design pattern. Furthermore, it trimmed in the configuration as a sound hood, and the sound hood was obtained. The noise-reduction effectiveness was inferior to the example 1.

[0050] As a <example 2 of comparison> surface layer 1, except having manufactured the nonwoven fabric by the card cross layer method, it carried out like the example 1 and the sound insulating material and the sound hood were obtained from the mixture of the 90 % of the weight of the 2-denier main fiber, and 10 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section. From an example 1, surface smooth nature is falling and the sound insulating material picked out from the press is insufficient of design nature. Since this runs short of the amounts of thermal melting arrival fiber of a surface layer, it is considered the main fiber should become fluffy and fold.

[0051] As a <example 3 of comparison> surface layer 1, it considered as the mixture of the 50 % of the weight of the 150-denier main fiber, and 50 % of the weight of sheath core mold thermal

melting arrival fiber of a 2-denier ellipse cross section, and except having manufactured the nonwoven fabric by the card cross layer method, it carried out like the example 1 and the sound insulating material and the sound hood were obtained. From an example 1, smooth nature is falling and the sound insulating material picked out from the press is insufficient of design nature for surface smooth nature.

[0052] As a <example 4 of comparison> base material layer, it considered as the mixture of 60 % of the weight of 150-denier fiber, and 40 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section, and except having manufactured the nonwoven fabric by the card cross layer method, it carried out like the example 1 and the sound insulating material and the sound hood were obtained. As for the sound insulating material picked out from the press, the noise-reduction effectiveness was falling rather than the example 1.

[0053] As a <example 5 of comparison> base material layer, except having manufactured the nonwoven fabric by the card cross layer method, it carried out like the example 1 and the sound insulating material and the sound hood were obtained from the mixture of 90 % of the weight of 6-denier KONJUKETO fiber, and 10 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section. As for the sound insulating material picked out from the press, thermal resistance was falling rather than the example 1.

[0054] The configuration of the sound insulating material obtained in the above-mentioned examples 1-12 and the examples 1-5 of a comparison is shown in Table 1.

[Test Example(s)] The following trials were performed about the sound insulating material and sound hood which were obtained in the above-mentioned examples 1-12 and the examples 1-5 of a comparison.

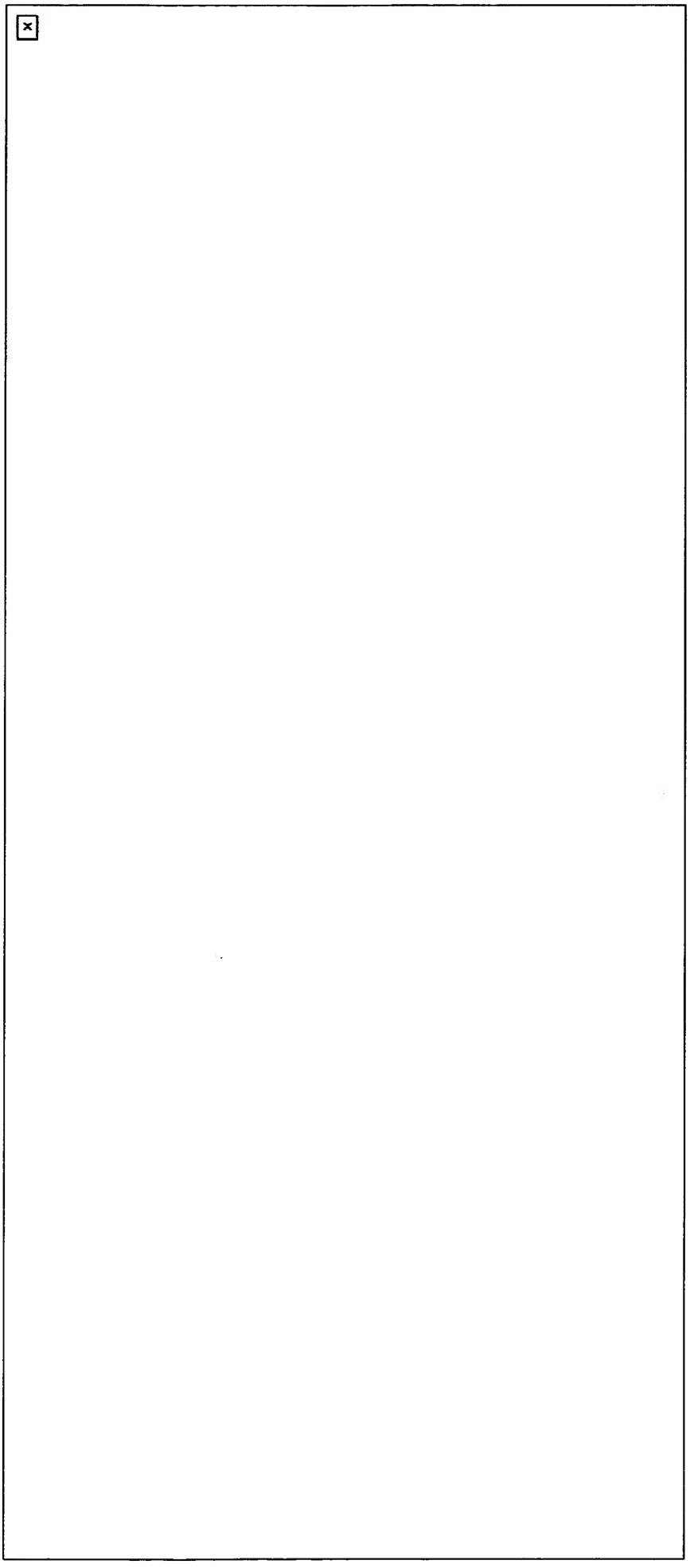
Change of noise level was measured with the <noise-reduction trial> system (microphone which installed the sound hood in the engine, reproduced the run state on chassis DYNAMO and was installed in the bonnet upper part). The result is shown in Table 1. Evaluation of front Naka was performed on the following criteria.

O -- Very excellent O -- Outstanding delta -- Equivalent level x -- [0055] worsened The <heat resistance test> heat cyclic trial estimated thermal resistance. The result is shown in Table 1. From the sound hood and the tabular base material made as an experiment, it started in fixed size, and several points were supported, heating cooling was cyclically repeated for between 90-120 degrees C and room temperatures, and the deformation (design nature) of a base material was measured.

[0056] The three-point bending test method estimated the sample started in the shape of a <stiffness test> strip of paper for flexural rigidity etc.

[0057]

[Table 1]



[0058]

[Effect of the Invention] According to this invention, the sound insulating material of the outstanding sound insulating construction which has noise-proof wall structure in acoustic material can be obtained by substituting for the base material of a sound hood the non-woven fabric sound insulating material which reconciled rigidity and absorption-of-sound nature from conventional resin (for example, Nylon), and preparing a still more desirable precise interlayer and/or a resin film. Moreover, since the desired design pattern was printed in the front face, it also became possible to reconcile the noise insulation engine performance and design nature.

TECHNICAL FIELD

[Field of the Invention] Especially this invention relates to a sound insulating material useful as a sound hood installed in the noise source of the internal combustion engine which generates the noise about a sound insulating material.

PRIOR ART

[Description of the Prior Art] In order that the car which used the internal combustion engine may prevent the noise reduction of the outside of vehicle, and vehicle interior of a room, a sound hood is installed in an internal combustion engine in many cases.

[0003] The hood insulator (4) which consists of a sound hood (3) and acoustic material, such as a glass fiber, in order to make it not take out outside the noise which is generated from the engine (1) in an engine room (2) in the case of an automobile from an engine room as shown in drawing 1 is installed in the engine room. Moreover, in order to aim at the noise reduction of vehicle indoor (6), the dash insulator (5) which consists of acoustic material and a rubber front face is installed in the upper part of the septum of vehicle indoor (6) and an engine room (2).

[0004] As the conventional sound hood is generally shown in drawing 2 , a base material (8) consists of ingredients which are excellent in thermal resistance like Nylon, and the design pattern (7) is added on the front face. Furthermore, in order to raise the sound isolation engine performance, the acoustic material (9) which consists of the felt, urethane, etc. is installed in the inferior surface of tongue of a sound hood, and there is a thing of wrap structure in it about acoustic material on the thing of the structure of giving the function which absorbs an internal combustion engine's noise, and the front face which has oil repellency.

[0005] However, on the configuration, it was not enough in that the noise is prevented, therefore the reduction effectiveness of the noise was not reduced, either but the conventional acoustic material of thickness or installation area was inadequate [the effectiveness] for below a certain fixed level. Moreover, since the rigidity of the sound hood itself was high, the sound hood itself had also become the generation source of the noise because a sound hood vibrates.

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, the sound insulating material of the outstanding sound insulating construction which has noise-proof wall structure in acoustic material can be obtained by substituting for the base material of a sound

hood the non-woven fabric sound insulating material which reconciled rigidity and absorption-of-sound nature from conventional resin (for example, Nylon), and preparing a still more desirable precise interlayer and/or a resin film. Moreover, since the desired design pattern was printed in the front face, it also became possible to reconcile the noise insulation engine performance and design nature

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The purpose of this invention solves the above-mentioned conventional problem, and is to offer the sound insulating material which has the sound absorbing and insulating characteristics which were excellent while having the surface aesthetic function.

MEANS

[Means for Solving the Problem] this invention persons ******(ed) the sound insulating material slack base material used for a sound hood etc., and reached a header and this invention by adding a design pattern to the front face with a print etc. in ** with which the design nature of a sound hood and outstanding sound absorbing and insulating characteristics are compatible.

[0008] That is, a sound insulating material according to claim 1 installs the nonwoven fabric surface layer 1 which makes a subject the thermal melting arrival fiber prepared on this base material in the upper part of the nonwoven fabric base material which carried out fabrication of the thermoplastic fiber object, and is characterized by coming to carry out the phanerosis of the design pattern on this surface layer 1.

[0009] Sound hood material according to claim 2 is characterized by coming further to prepare the compact layer which consists of a fiber object between a surface layer 1 and a base material, or the interlayer who consists of thermoplastic film-like resin which does not have permeability in a sound insulating material according to claim 1.

[0010] Sound hood material according to claim 3 is characterized by forming the compact layer which changes from a fiber object to a noise source and the facing near base material side further, or the surface layer 2 which consists of thermoplastic film-like resin which does not have permeability, and changing in a sound insulating material according to claim 2.

[0011] a sound insulating material according to claim 4 -- claims 1-3 -- in a sound insulating material given [one of] in a term, fiber is thermoplastic polyester fiber and is characterized by consisting of a matrix fiber and thermal melting arrival nature fiber, including ****** fiber.

[0012] a sound insulating material according to claim 5 -- claims 1-4 -- in a sound insulating material given [one of] in a term, a design pattern is characterized by being formed of the textile printing by the hot printing print and screen printing.

[0013]

[Embodiment of the Invention] The sound insulating material of this invention is a multilayer fiber object which consists of nonwoven fabrics, and the design pattern is formed in the front face. It comes to carry out the phanerosis of the design pattern on this surface layer 1 including the nonwoven fabric surface layer 1 which makes a subject the thermal melting arrival fiber which established the thermoplastic fiber

object preferably on the nonwoven fabric base material which carried out fabrication, and this base material.

[0014] The sound insulating material of this invention forms for example, the base material layer (11) part used as the body of a sound hood etc. from the nonwoven fabric object of thermoplastic fiber.

[0015] that a rigid field to whose diameter of fiber is 0.05-50 deniers although narrow-diameter-izing if possible is desirable as fiber which constitutes a nonwoven fabric when the diameter of fiber is taken into consideration from the absorption-of-sound engine performance in order to suppress deformation of a sound insulating material, for example, a sound hood, -- desirable -- further -- desirable -- 0.1-30-denier thermoplastic fiber -- polyester fiber is applied preferably. If the above-mentioned diameter of fiber is too small, the permeability of a carding machine will be inferior and a quality nonwoven fabric will not be obtained. On the other hand, since surface texture will become coarse if the diameter of fiber is too large, it is not desirable.

[0016] the inside of the above-mentioned polyester fiber -- especially -- acquisition -- since the melting point, tensile strength, and a modulus achieve the support function as a matrix fiber effectively comparatively highly, an easy polyethylene terephthalate fiber is desirable. Furthermore, preferably, since the side-by-side mold conjugate fiber which compounded gay polyester and copolymerized polyester along with the fiber axis discovers crimp by heat treatment, and raises whenever [confounding / of a nonwoven fabric] and its moldability increases, it is desirable.

[0017] Furthermore, as for the fiber which constitutes the nonwoven fabric in this invention, it is desirable to come to include [thermal melting arrival nature fiber] the matrix fiber which consists of at least two kinds of staple fibers, and achieves a support function, and between fiber. As this thermal melting arrival fiber, the copolymerized polyester to which the melting point was usually reduced by comonomers, such as a copolymerization polymer, for example, isophthalic acid etc., is used suitably. Thermal melting arrival fiber is softened or fused at the temperature below the softening temperature of heat treatment, for example, gay polyester, and discovers welding nature. Although heat treatment is performed at the welding nature manifestation temperature of thermal melting arrival fiber under the softening temperature temperature of a matrix fiber, the above-mentioned smoothing heat treatment also as an independent process, heat treatment at the time of hot printing, etc. may be used. By this heat treatment, paste up the configuration fiber which crosses thermal melting arrival fiber on an intersection, and gestalt stability is given to a nonwoven fabric, and also it collaborates with the support function of a matrix fiber, and the shape of toothing of a nonwoven fabric side is absorbed, or it becomes possible to give irregularity intentionally to stability on a front face. It is also possible to give the shape of toothing at coincidence to both sides, of course.

[0018] Although the single component fiber which consists of the above-mentioned thermal melting arrival nature polymer is sufficient, if the sheath core mold conjugate fiber which uses a homopolymer as a heart component and uses a thermal melting arrival nature copolymerization polymer as a sheath component is used, since thermal melting arrival fiber can achieve a thermal melting arrival function, with the support

function of a heart component maintained, it is still more suitable. Moreover, hardening of the nonwoven fabric by formation of a side-by-side mold conjugate fiber, then too much welding point can also be prevented.

[0019] Especially a limit does not have variant cross sections, such as circular [regular as a cross-section configuration of fiber] or flatness, a Y-globe type, and a hollow form, etc. The sound absorbing and insulating characteristics of a nonwoven fabric can be adjusted by carrying out the optimum dose blend of the hollow filament especially. Furthermore, it can also contribute to improvement in the entanglement by crimp manifestation, and a moldability by making a hollow filament into a side-by-side conjugate fiber.

[0020] There is especially no limit also about the color tone of fiber, and it is also possible in the arrival fiber at Hara of various color tones besides general white independent or to combine and use it. By using the arrival fiber at Hara especially, it can combine with surface design encaustic color, and the width of face of an ornament and a fine sight can be expanded.

[0021] Since it is expected that the temperature in an engine room becomes quite high, the melting point of the thermal melting arrival section of thermal melting arrival nature fiber has the desirable thermal melting arrival component which has the melting point of 150 degrees C or more.

[0022] The mixed rates of the matrix fiber and thermal melting arrival fiber which constitute a base material layer are 90:10-40:60. The base material layer which has moderate rigidity and a moldability as it is this range can be obtained.

[0023] As for the superintendent officer of a base material layer, it is desirable that it is two or more 500 g/m and 2 or less [2kg //m]. In less than two 500 g/m, even if it makes the content of thermal melting arrival fiber high, it is difficult to secure desired rigidity and the absorption-of-sound engine performance. Moreover, although there is no engine-performance top problem when 2 kg/m2 is exceeded, the increase of weight is caused. A maximum of 50mm or less of thickness is desirable at 5mm or more. In less than 5mm, flexural rigidity and absorption-of-sound performance degradation are large. Moreover, it is not realistic, if it exceeds 50mm and the installation to a narrow engine room will be considered.

[0024] Furthermore, the surface layer 1 of the nonwoven fabric object which mixed thermal melting arrival fiber 50% of the weight or more desirably (10) is installed in the upper part of a base material layer (11). When a joint with the main fiber increased and carries out hot forming of the thermal melting arrival nature fiber by blending with 50 % of the weight or more so much, it is possible the fuzz of a surface part and to lessen irregularity. As thermal melting arrival fiber, what was used in the above-mentioned base material layer can be used. The same is said of the diameter of fiber, and a cross-section configuration.

[0025] Preferably, the diameter of average fiber including the main fiber of a surface layer 1 has desirable 2 deniers or less. We are anxious about sound leakage becoming large because irregularity will arise on a front face if the diameter of average fiber becomes large, design nature falls and permeability becomes high.

[0026] As a superintendent officer of an epidermis layer, two or less [2 or more / 100g //m / g //m / 1000] are desirable. Less than [100g //m] by two, an epidermis layer is

transparent, and since the part whose base material layer can be seen appears, appearance worsens. Even if it exceeds 1000 g/m2, there is no big problem, but since the weight as engine enclosure increases, two or less [1000g //m] are desirable. 2-5mm of thickness is desirable. If it exceeds 5mm, on the whole, openings will increase in number, and appearance will fall.

[0027] Furthermore, preferably, between a surface layer 1 and a base material layer, by preparing an interlayer (12), the sound insulating material of this invention can enlarge the mass of a surface layer 1 further, and can heighten the noise-reduction effectiveness. As this interlayer, the compact layer which consists of a nonwoven fabric fiber object, or the thing which consists of thermoplastic film-like resin which does not have permeability can be used. As a nonwoven fabric fiber object, the nonwoven fabric object which mixed polyester fiber and the thermal melting arrival fiber of a polyester system and which can be fabricated can be used, and a compact layer is taken as a precise layer by heating and compressing the above-mentioned nonwoven fabric object at the time of formation. Moreover, as thermoplastic film-like resin which does not have permeability, the film of a polyester system, the film-like resin of a polyethylene system, etc. can be used.

[0028] In the frequency domain of the noise made into an aim, the superintendent officer of an interlayer who produces film resonance is desirable, and is uniquely decided by the superintendent officer about thickness. When engine enclosure is assumed, since it is not desirable to cause the increase of weight of a car, as an interlayer's weight, a set is a limit in several kg /.

[0029] Furthermore, preferably, in addition to the above-mentioned interlayer (12), by preparing a surface layer (2) in a noise source and the facing near base material side, the sound insulating material of this invention can be used as the double wall sound-insulating-construction object which makes acoustic material of a base material an interstitial segment, and can raise the noise-reduction effectiveness further. As this surface layer 2, the same thing as the above-mentioned interlayer can be used.

[0030] As the above-mentioned base material layer, a surface layer 1, and an approach of carrying out the laminating of an interlayer and/or the surface layer 2 preferably, a base material layer and a surface layer are heated at about 200 degrees C through a hot blast heating furnace, and it fabricates in cold pressing. When installing an interlayer furthermore, after a base material layer is installed with a cold pressing machine, an interlayer is installed, an epidermis layer is installed further and coincidence shaping is performed. The thickness of each class fabricates an epidermis layer to 2-5mm, and fabricates a base material layer to 5-50mm.

[0031] The nonwoven fabric which gives a design pattern with a hot printing print becomes possible [imprinting a design pattern to homogeneity] further by preforming by heat treatment or needle punching beforehand, and graduating the front face.

[0032] As the manufacture approach of giving design nature, the textile printing of wet print methods, such as a roller print, an ink jet, and screen printing, or the dry type print method of an imprint type is shown in a nonwoven fabric front face. If it sees from a viewpoint of the simplification of a manufacturing facility, the dry type print is more advantageous. After heating and pressurizing a non-woven fabric,

superposition, and both for the encaustic side of a hot printing print sheet by the heating plate especially, the hot printing printing method which exfoliates a hot printing print sheet from a nonwoven fabric is desirable.

[0033] Thus, it can be used as a sound hood by trimming the obtained sound insulating material in the configuration for which it asks.

[0034] In order to prepare a part for configuration grant and the concave heights for giving design nature to a surface part in the sound hood itself, it can consider as a required configuration according to heating and a press process. It is also possible to give the absorption-of-sound nature by a kind of film resonance by the superintendent officer of a surface layer by setting up the permeability of this surface layer 1 low here. This is that the resonance according to the mass of a surface layer occurs, and is the phenomenon of demonstrating the high absorption-of-sound engine performance by film resonance by a certain constant frequency. When a frequency domain unique as engine noise exists, it becomes possible to use film resonance of a surface layer.

EXAMPLE

[Example] A following example and the following example of a comparison explain this invention.

As a <example 1> surface layer 1, the nonwoven fabric of the 200 g/m2 superintendent officer who manufactured by the card cross layer method was used from the 50 % of the weight of the 2-denier main fiber made from polyester, and 50 % of the weight [of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section] (sheath-core mold thermal melting arrival fiber of a polyester system) mixture.

[0036] As a base material layer, the non-woven fabric of the 800 g/m2 superintendent officer who manufactured by the card cross layer method was used from the mixture of 40 % of the weight of 6-denier KONJUKETO main fiber made from polyester, and 60 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (sheath-core mold thermal melting arrival fiber of a polyester system).

[0037] The laminating of the above-mentioned surface layer 1 and the base material layer was carried out, it heat-treated at 180 degrees C, and superintendent officer 1000 g/m2 and a preforming object with a thickness of 30mm were acquired. Subsequently, the acquired imprint side of a preforming object and a hot printing print sheet was fabricated at 200 degrees C for about 60 seconds with superposition and a press machine face to face, it compressed into the thickness of 10mm, and the sound insulating material was obtained. It checked that the nonwoven fabric object picked out from the press had acquired the desired design pattern. Furthermore, it trimmed in the configuration as a sound hood, and the sound hood was obtained. The obtained sound hood was excellent in sound-absorbing-and-insulating ability in the noise-reduction trial mentioned later as compared with the conventional sound hood, and it became clear that design nature was also equivalent level. It excelled in configuration holdout also by heat cyclic test evaluation furthermore mentioned later.

[0038] In <example 2> this example, the compounding ratio of the thermal melting arrival fiber of a surface layer 1 was made high, surface smooth nature was raised, and design nature was raised. As a surface layer 1, the sound insulating material and

the sound hood were obtained from the mixture of the 25 % of the weight of the 2-denier main fiber made from polyester, and 75 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (sheath-core mold thermal melting arrival fiber of a polyester system) like the example 1 except having manufactured the nonwoven fabric by the card cross layer method. It checked that surface smooth nature of the sound insulating material picked out from the press was improving rather than the example 1, and design nature was improving. Moreover, it excelled also in the noise-reduction effectiveness or thermal resistance.

[0039] In <example 3> this example, by narrow-diameter-izing the diameter of the main fiber of a surface layer 1, surface smooth nature was raised and design nature was raised. As a surface layer 1, the sound insulating material and the sound hood were obtained from the mixture of the 50 % of the weight of the 0.5-denier main fiber made from polyester, and 50 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (polyester system sheath-core mold thermal melting arrival fiber) like the example 1 except having manufactured the non-woven fabric by the card cross layer method. It checked that surface smooth nature of the sound insulating material picked out from the press was improving rather than the example 1, and design nature was improving. Moreover, it excelled also in the noise-reduction effectiveness or thermal resistance.

[0040] In <example 4> this example, by forming the main fiber of a base material layer into a variant cross section, the surface area of a fiber object was increased and the absorption-of-sound engine performance was raised. As a base material layer, the sound insulating material and the sound hood were obtained from the mixture of 60 % of the weight of 2-denier Y mold modified cross section fibers made from polyester, and 40 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (polyester system sheath-core mold thermal melting arrival fiber) like the example 1 except having manufactured the nonwoven fabric by the card cross layer method. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0041] In <example 5> this example, the absorption-of-sound engine performance was raised by raising the superintendent officer of the base material layer of an example 4. As a base material layer, the sound insulating material and the sound hood were obtained from the mixture of 60 % of the weight of 2-denier Y mold modified cross section fibers made from polyester, and 40 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section (polyester system sheath-core mold thermal melting arrival fiber) like the example 1 except having manufactured the nonwoven fabric of 1200 g/m2 by the card cross layer method. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0042] In <example 6> this example, it is installing the compact layer of a nonwoven fabric fiber object in the middle of the base material layer of an example 1, and a surface layer 1, the part equivalent to the wall of noise-proof wall structure was constituted, and the noise insulation engine performance was raised. The surface

layer 1 and the base material layer presupposed that it is the same as that of an example 1, and obtained the sound insulating material and the sound hood like the example 1 except having manufactured the nonwoven fabric of twice as many 400 g/m2 as this for the superintendent officer by the same fiber combination as a surface layer 1 as an interlayer. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0043] In <example 7> this example, it is installing a thermoplastic film-like interlayer in the middle of the base material layer of an example 1, and a surface layer 1, the part equivalent to the wall of noise-proof wall structure was constituted, and the noise insulation engine performance was raised. The surface layer 1 and the base material layer presupposed that it is the same as that of an example 1, applied polyethylene (PE) to the inferior surface of tongue of a surface layer 1 two times 400 g/m as the middle class, and prepared the film. The laminating of the surface layer 1 and base material layer in which this film was prepared was carried out, it fabricated like the example 1, and the sound insulating material and the sound hood were obtained. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0044] In <example 8> this example, it is installing a thermoplastic film-like interlayer in the middle of the base material layer of an example 1, and a surface layer 1, the part equivalent to the wall of noise-proof wall structure was constituted, and the noise insulation engine performance was raised. Furthermore, an interlayer's superintendent officer was enlarged and the effectiveness (improvement in the noise insulation engine performance) of mass was secured. The surface layer 1 and the base material layer presupposed that it is the same as that of an example 1. As the middle class, ethylene vinyl acetate (EVA) was applied to the inferior surface of tongue of a surface layer 1 two times 1500 g/m, and the film was prepared. The laminating of the surface layer 1 and base material layer in which this film was prepared was carried out, it fabricated like the example 1, and the sound insulating material and the sound hood were obtained. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0045] In <example 9> this example, it is installing a surface layer 2 in the lower part of a base material layer in addition to an example 6, double wall sound insulating construction was formed in the interlayer and the surface layer 2, and the noise insulation engine performance was raised further. The surface layer 1, the interlayer, and the base material layer presupposed that it is the same as that of an example 6, except the surface layer 2 having installed the same thing as the interlayer of an example 6, fabricated like the example 1 and obtained the sound insulating material and the sound hood. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0046] In <example 10> this example, a thermoplastic film is substituted for an interlayer and a surface layer 2 in an example 9. Since it became possible to intercept

aeration completely by using a film, the noise insulation engine performance in a RF region was able to be raised especially. Moreover, double wall sound insulating construction was formed in the interlayer and the surface layer 2, and the noise insulation engine performance was raised further. The surface layer 1 and the base material layer presupposed that it is the same as that of an example 9. As the middle class, 400g (PE) /of polyethylene was applied to the inferior surface of tongue of a surface layer 1 two times m, the film was prepared, polyethylene (PE) was applied to the inferior surface of tongue of a base material layer two times 400 g/m as a surface layer 2, and the film was prepared. It fabricated like the example 1 and the sound insulating material and the sound hood were obtained. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0047] In <example 11> this example, the superintendent officer of an interlayer and a surface layer 2 is enlarged in an example 10. Moreover, double wall sound insulating construction was formed in the interlayer and the surface layer 2, and the noise insulation engine performance was raised. The surface layer 1 and the base material layer presupposed that it is the same as that of an example 10. As the middle class, 1500g (EVA) /of ethylene vinyl acetate was applied to the inferior surface of tongue of a surface layer 1 two times m, the film was prepared, ethylene vinyl acetate (EVA) was applied to the inferior surface of tongue of a base material layer two times 1500 g/m as a surface layer 2, and the film was prepared. It fabricated like the example 1 and the sound insulating material and the sound hood were obtained. The noise-reduction effectiveness of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or thermal resistance.

[0048] In <example 12> this example, rigid improvement was carried out by mixing ** denier fiber for the main fiber of a base material layer. The surface layer 1 presupposed that it is the same as that of an example 1. As a base material layer, the nonwoven fabric was manufactured by the card cross layer method from the 10 % of the weight of 6-denier KONJUKETO fiber, 50 % of the weight of 13-denier KONJUKETO fiber, and 40 % of the weight [of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section] mixture. The superintendent officer was taken as 800 g/m2. It fabricated like the example 1 and the sound insulating material and the sound hood were obtained. Rigidity of the sound insulating material picked out from the press was improving further, and it excelled the example 1 also in design nature or the noise-reduction effectiveness.

[0049] As a <example 1 of comparison> surface layer 1, 50 g/m2 superintendent officer's nonwoven fabric was manufactured by the card cross layer method from the mixture of the 50 % of the weight of the 2-denier main fiber, and 50 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section. 800 g/m2 superintendent officer's nonwoven fabric was manufactured by the card cross layer method as a base material layer from the mixture of 40 % of the weight of 6-denier KONJUKETO main fiber, and 60 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section. The laminating of a surface

layer 1 and the base material layer was carried out, it heat-treated at 180 degrees C, and superintendent officer 1000 g/m2 and a preforming object with a thickness of 30mm were acquired. Subsequently, the imprint side of a preforming object and a hot printing print sheet was fabricated at 200 degrees C for about 60 seconds with superposition and a press machine face to face. Since the nonwoven fabric picked out from the press ran short of the superintendent officers of a surface layer, a part of base material layer was exposed, and it was not able to acquire a desired design pattern. Furthermore, it trimmed in the configuration as a sound hood, and the sound hood was obtained. The noise-reduction effectiveness was inferior to the example 1.

[0050] As a <example 2 of comparison> surface layer 1, except having manufactured the nonwoven fabric by the card cross layer method, it carried out like the example 1 and the sound insulating material and the sound hood were obtained from the mixture of the 90 % of the weight of the 2-denier main fiber, and 10 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section. From an example 1, surface smooth nature is falling and the sound insulating material picked out from the press is insufficient of design nature. Since this runs short of the amounts of thermal melting arrival fiber of a surface layer, it is considered the main fiber should become fluffy and fold.

[0051] As a <example 3 of comparison> surface layer 1, it considered as the mixture of the 50 % of the weight of the 150-denier main fiber, and 50 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section, and except having manufactured the nonwoven fabric by the card cross layer method, it carried out like the example 1 and the sound insulating material and the sound hood were obtained. From an example 1, smooth nature is falling and the sound insulating material picked out from the press is insufficient of design nature for surface smooth nature.

[0052] As a <example 4 of comparison> base material layer, it considered as the mixture of 60 % of the weight of 150-denier fiber, and 40 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section, and except having manufactured the nonwoven fabric by the card cross layer method, it carried out like the example 1 and the sound insulating material and the sound hood were obtained. As for the sound insulating material picked out from the press, the noise-reduction effectiveness was falling rather than the example 1.

[0053] As a <example 5 of comparison> base material layer, except having manufactured the nonwoven fabric by the card cross layer method, it carried out like the example 1 and the sound insulating material and the sound hood were obtained from the mixture of 90 % of the weight of 6-denier KONJUKETO fiber, and 10 % of the weight of sheath core mold thermal melting arrival fiber of a 2-denier ellipse cross section. As for the sound insulating material picked out from the press, thermal resistance was falling rather than the example 1.

[0054] The configuration of the sound insulating material obtained in the above-mentioned examples 1-12 and the examples 1-5 of a comparison is shown in Table 1.

[Test Example(s)] The following trials were performed about the sound insulating material and sound hood which were obtained in the above-mentioned examples 1-12

and the examples 1-5 of a comparison.
Change of noise level was measured with the <noise-reduction trial> system (microphone which installed the sound hood in the engine, reproduced the run state on chassis DYNAMO and was installed in the bonnet upper part). The result is shown in Table 1. Evaluation of front Naka was performed on the following criteria.
O -- Very excellent O -- Outstanding delta -- Equivalent level x -- [0055] worsened The <heat resistance test> heat cyclic trial estimated thermal resistance. The result is shown in Table 1. From the sound hood and the tabular base material made as an experiment, it started in fixed size, and several points were supported, heating cooling was cyclically repeated for between 90-120 degrees C and room temperatures, and the deformation (design nature) of a base material was measured.
[0056] The three-point bending test method estimated the sample started in the shape of a <stiffness test> strip of paper for flexural rigidity etc.
[0057]
[Table 1]

各仕様の考え方		表皮層 1			基材層				中間層			表皮層 2			吸遮音性能	意匠性	剛性
		熱融着繊維 重量%	主繊維 重量%	目付け g／m²	熱融着繊維 重量%	主繊維1 重量%	主繊維2 重量%	目付け g／m²	熱融着繊維 重量%	主繊維 重量%	目付け g／m²	熱融着繊維 重量%	主繊維 重量%	目付け g／m²			
基本仕様	実施例1	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	○	○
表皮層のﾊﾞｲﾝﾀﾞｱｯﾌﾟで平滑性を上げ、意匠性向上	実施例2	2d:75%	2d:25%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	◎	○
主繊維細径化による 表皮層の平滑性ｱｯﾌﾟ、意匠性向上	実施例3	2d:50%	0.5d:50%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	◎	○
基材層の主繊維異形断面化による吸音性能向上	実施例4	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	○	○
実施例4の基材層目付けｱｯﾌﾟによる吸音性能向上	実施例5	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	1200	−	−	−	−	−	−	◎	○	○
実施例1＋中間層で遮音性能向上	実施例6	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	2d:50%	2d:50%	400	−	−	−	◎	○	○
実施例1＋中間層で遮音性能向上：フィルム	実施例7	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	熱可塑性ﾌｨﾙﾑ(PE)		400	−	−	−	○	○	○
実施例1＋中間層の目付けｱｯﾌﾟで遮音性能向上	実施例8	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	熱可塑性ﾌｨﾙﾑ(EVA)		1500	−	−	−	◎	○	○
実施例1＋中間層＋表皮層2で遮音性能向上	実施例9	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	2d:50%	2d:50%	400	2d:50%	2d:50%	400	◎	○	○
実施例1＋中間層＋表皮層2ﾌｨﾙﾑで遮音性能向上	実施例10	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	熱可塑性ﾌｨﾙﾑ(PE)		400	熱可塑性ﾌｨﾙﾑ(PE)		400	◎	○	○
実施例1＋中間層＋表皮層2ﾌｨﾙﾑで遮音性能向上	実施例11	2d:50%	2d:50%	200	2d:40%	6dC:60%	−	800	熱可塑性ﾌｨﾙﾑ(EVA)		1500	熱可塑性ﾌｨﾙﾑ(EVA)		1500	◎	○	○
基材層の剛性向上	実施例12	2d:50%	2d:50%	200	2d:40%	6dC:10%	13dC:50%	800	−	−	−	−	−	−	○	○	◎
表皮層の目付け不足で意匠性NG	比較例1	2d:50%	2d:50%	50	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	×	○
表皮層の熱融着繊維不足で表皮に毛羽立ちNG	比較例2	2d:10%	2d:90%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	○	×	○
表皮層の太繊維化で凹凸NG，吸音性能低下	比較例3	2d:50%	150d:50%	200	2d:40%	6dC:60%	−	800	−	−	−	−	−	−	△	×	○
基材層の太繊維化で吸音性能低下	比較例4	2d:50%	2d:50%	200	2d:40%	150d:60%	−	800	−	−	−	−	−	−	×	×	○
基材層の熱融着繊維不足で剛性低下	比較例5	2d:50%	2d:50%	200	2d:10%	6dC:90%	−	800	−	−	−	−	−	−	×	△	×

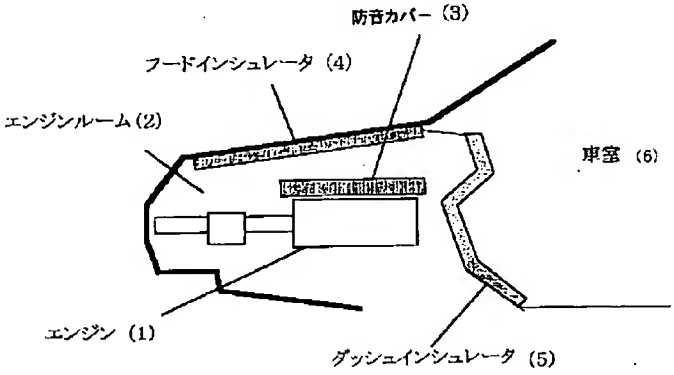
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

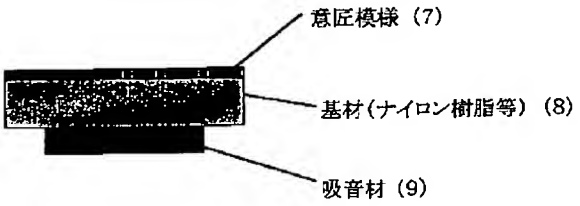
[Drawing 1] It is drawing having shown the inside of the engine room of an automobile typically.

[Drawing 2] It is the outline sectional view of the conventional sound hood.
[Drawing 3] It is the outline sectional view of an example of a sound hood by this invention.
[Drawing 4] It is the outline sectional view of a sound hood by this invention in which the middle class was prepared.
[Drawing 5] It is the outline sectional view of a sound hood by this invention in which the surface layer 2 was formed.
[Description of Notations]
1 Engine
2 Engine Room
3 Sound Hood
4 Hood Insulator
5 Dash Insulator
6 Vehicle Room
7 Design Pattern
8 Base Materials (Nylon Etc.)
9 Acoustic Material
10 Surface Layer 1
11 Base Material Layer
12 Interlayer
13 Surface Layer 2
DRAWINGS

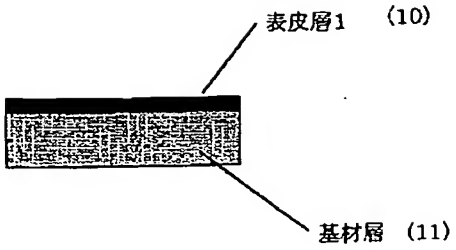
[Drawing 1]



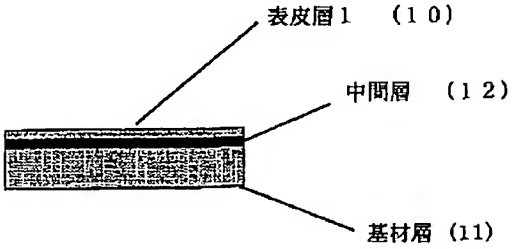
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Drawing 5]